GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Biomaterial technologies, PG_00071181						
Field of study							
Date of commencement of studies	February 2027		Academic year of realisation of subject	2026/2027			
Education level	second-cycle studies		Subject group				
Mode of study	Part-time studies		Mode of delivery	at the university			
Year of study	1		Language of instruction	Polish			
Semester of study	1		ECTS credits	3.0			
Learning profile	general academic profile		Assessment form	assessment			
Conducting unit	Department of Polymer Technology -> Faculty of Chemistry -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Justyna Kucińska-Lipka				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	9.0	0.0	9.0	0.0	0.0	18
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours	Self-study	SUM	
	Number of study hours	18		8.0	49.0	75	
Subject objectives	The aim of the course is to provide students with fundamental knowledge and practical skills in the design, synthesis, modification, and characterization of polymer biomaterials. Students will be introduced to the definition of a biomaterial and to a comparison of the properties of polymeric, metallic, and ceramic biomaterials. Examples of polymers intended for applications in medicine and tissue engineering will be presented, along with the relationships between their chemical structure and their physicochemical, mechanical, and biological properties.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W07] ma wiedzę o trendach rozwojowych i najistotniejszych nowych osiągnięciach dotyczącą zagadnień związanych z technologią materiałową i recyklingiem	The student knows and is able to indicate the latest material and technological achievements in the area of polymer materials for medical applications.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects
[K7_K01] understands the need for lifelong learning, is able to inspire and organize the learning process of others. is aware of his/her own limitations and knows when to turn to experts, is able to set priorities appropriately for the implementation of tasks defined by himself/herself or others	The student understands the need for further education in the field of materials and technologies used in the medical field due to the dynamic development of this scientific field.	[SK2] Assessment of progress of work [SK4] Assessment of communication skills, including language correctness
[K7_K02] is aware of the importance of non-technical aspects and effects of engineering activities, including their impact on the environment and the associated responsibility for decisions made	The student understands the non-technical aspects of an engineer's activity in the field of polymeric biomaterials, including the impact of the materials and technologies used on the environment and human health, and acts in accordance with the principles of professional ethics.	[SK2] Assessment of progress of work [SK4] Assessment of communication skills, including language correctness
[K7_W04] has in-depth knowledge in the field of chemical sciences/chemical engineering/materials engineering, enabling the description of the properties of materials, processes and technological operations involving them, taking into account recycling	The student has knowledge of the technological and functional properties of polymers used as biomaterials and knows the physical basics and selected methods of their processing, understanding the impact of the manufacturing process on the final properties of the material.	[SW1] Assessment of factual knowledge
[K7_U06] is able to assess the usefulness and possibility of using new achievements (techniques and technologies) in the field of design, modernization and optimization of material technologies and their recycling	The student is able to assess the possibility of using modern material and technological achievements in the field of materials for medical applications.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject
[K7_U03] is able to formulate a research hypothesis, design an experiment necessary to confirm it and is able to use appropriately selected measurement and laboratory methods	The student is able to operate laboratory equipment used in the study of polymeric biomaterials and perform basic analyses of their physicochemical and mechanical properties.	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools

Subject contents

Course content – lecture

- Introduction to polymer biomaterials
- Applications of biomaterials
- Implants materials and characterization
- Tissue engineering and tissue scaffolds
- Polymer hydrogels characterization and properties
- Methods for biomaterials testing

Course content – laboratory

- Health and safety regulations and laboratory organization
- Polymer hydrogels synthesis and characterization
- Tissue scaffolds synthesis and characterization
- Polymeric protective coatings synthesis and characterization
- 3D printing of polymers for medical applications

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
lecture (written test)	60.0%	55.0%
laboratory (entry tests, reports, attendance and activity)	60.0%	45.0%

Recommended reading

Basic literature

- M. Błażewicz, W. Stoch, Biomateriały, Akademicka Oficyna Wydawnicza EXIT, Warszawa, 2019
- B. Świeczko-Żurek, Biomateriały, Wydawnictwo Politechniki Gdańskiej, 2009
- J. Marciniak, Biomateriały, Wydawnictwo Politechniki Śląskiej, 2002

	Supplementary literature	• Y. Liu, K. Hwa Chan, Advances in Hydrogels, Mdpi AG, 2022 • B. D. Ratner, A. S. Hoffman, F. J. Schoen, J. E. Lemons, Biomaterials Science: An Introduction to Materials in Medicine, Elsevier Science Publishing Co Inc, 2020 • P. Ma, Biomaterials and Regenerative Medicine, Cambridge University Press, 2014
	eResources addresses	
Example issues/ example questions/ tasks being completed	• Provide a definition of biomaterial. • Classify polymeric biomaterials based on their origin. • Compare the properties of polymeric biomaterials with metallic and ceramic biomaterials. • List and characterize three key applications of polymeric biomaterials in medicine. • Propose and characterize a method for obtaining a tissue scaffold for a given application. • Propose a research methodology to characterize a biomaterial for implant applications.	
Practical activites within the subject	Not applicable	

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